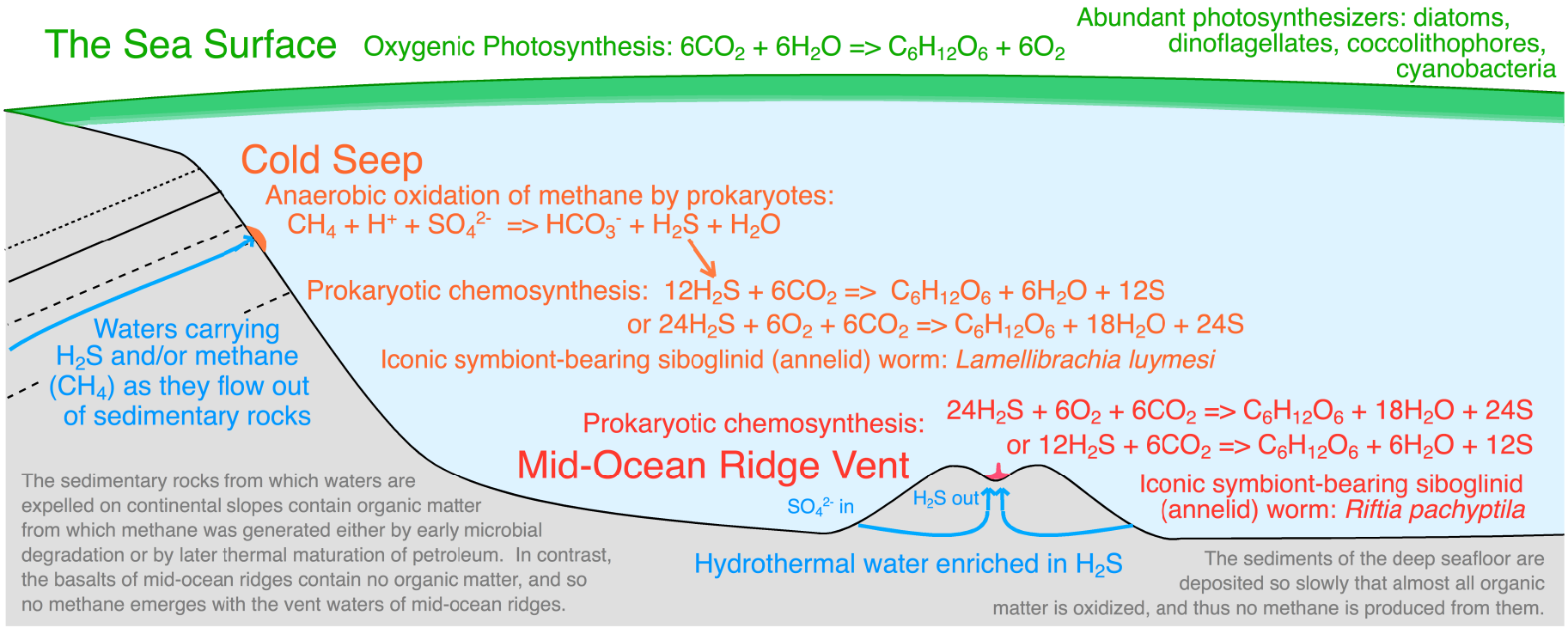
Photosynthetic and chemosynthetic marine ecosystems: the sea surface, hydrothermal vents, and cold seeps



	The sea-surface ecosystem	*Vent and seep ecosystems*
Geography:	Spread across entire ocean surface (with organic matter dropping to heterotrophs below)	Very localized on seafloor
Energy source:	Sunlight	Chemical energy of reduced C or S (or H)
Chemistry:	Photosynthesis	Chemosynthesis and methanotrophism
Synthesizers:	single-celled eukaryotes and prokaryotes	Prokaryotes

Chemical species in the reactions above:
- H_2S Hydrogen sulfide
- CH_4 Methane
- CO_2 Carbon dioxide
- SO_4^{2-} Sulfate
- H_2O Water
- HCO_3^- Bicarbonate
- $C_6H_{12}O_6$ Carbohydrate, or more generally "organic matter"

The cold-seep chemical reactions shown above are in part derived from Dattagupta et al. (2006 *Jo. Exp. Biol.* 209, 3795-3805).
Multiple chemical reactions for sulfide-driven chemosynthesis exist in the literature, and so two are shown here.